MULTIMEDIA UNIVERSITY

STUDENT ID NO

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# MULTIMEDIA UNIVERSITY

# FINAL EXAMINATION

**TRIMESTER 2, 2017/2018**

## PMT0101 – MATHEMATICS I

(Foundation in Information Technology)

02 MARCH 2018
(9:00 A.M. – 11:00 A.M.)
(2 Hours)

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**INSTRUCTIONS TO STUDENT**

1. This question paper consists of 5 pages with **FIVE** questions.
2. Attempt **ALL** questions. All questions carry equal marks and the distribution of the marks for each question is given.
3. Please write all your answers in the answer booklet provided.
4. **No calculators are allowed**.
5. **You are required to write all relevant steps** to obtain maximum marks.

**No Calculators are allowed.**
**You are required to write proper steps.**

## QUESTION 1 [10 marks]

a) Simplify the expression and write your final expression as a fraction with no negative exponents. Assume all variables have non zero values.

$$\frac{m^7 \times \left(8e^3\right)^{\frac{1}{3}}}{\left(2m^{-2}e^3\right)^2}$$

[2 marks]

b) Rationalize the denominator for $\frac{4\sqrt{3}+2}{2\sqrt{3}-1}$ and simplify.

[2 marks]

c) Simplify the following expression and write your final expression as a single term. Assume all variables have positive values.

$$b^2\left(\sqrt{\frac{32a^3b}{c^4}}\right) - \frac{ac^2}{b}\sqrt{\frac{98ab^7}{c^8}}$$

[2 marks]

d) Factor the polynomial completely.

$27 - 8x^3$

[2 marks]

e) Find $\left(\frac{\sqrt{3}}{2} - \frac{1}{2}i\right)^2$ and write the final result in standard form $a+bi$, where $a$ and $b$ are real numbers.

[2 marks]

**Continued...**

**QUESTION 2 [10 marks]**

a) i) Factorize completely $6x^3 - 5x^2 - 6x$.
Hence, solve $6x^3 - 5x^2 - 6x = 0$.

ii) Solve the inequality $6x^3 - 5x^2 - 6x \leq 0$.

Show clearly your Sign Diagram and give your final answer in interval notation.

[6 marks]

b) Solve $\sqrt{12x+13} = 2x+3$. Remember to check your answers.

[4 marks]

**Continued...**

**QUESTION 3 [10 marks]**

a) Given $f(x)=2x-3$ and $g(x)=(x-2)^2+1$, find

i) $f^{-1}(x)$,

ii) $(f^{-1}\circ g)(3)$.

iii) Determine the minimum point and $y$-intercept of $g$.

Hence, sketch the graph of $g$. Show clearly the minimum point and the $y$- intercept.

State its range in interval notation.

[5 marks]

b) Given the polynomial function $f(x)=x(x+3)^2(x-5)^3$.

i) What is the **degree** of $f$?

ii) Determine **the zeros** of $f$ **and their multiplicities**.
Also, determine whether the graph of $f$ crosses or touches the $x$-axis at each zero.

iii) Determine its $y$-intercept.

iv) Determine the end behavior of $f$.

v) Sketch the graph of the polynomial function.
Make sure your graph shows all intercepts and exhibits the proper end behaviour.

[5 marks]

**Continued...**

**QUESTION 4 [10 marks]**

a) The graph of $f(x) = 2 - \log_3(x + a)$ passes through point $(26, -1)$.
Find the value of $a$.

[2 marks]

b) Solve $9^{-x+15} = 27^{x+3}$.

[2 marks]

c) Solve $\ln(x-1) - \ln(x+6) = \ln(x-2) - \ln(x+3)$.

[2 marks]

d) Find the value of $p$, if $(x-2)$ is a factor of function $P(x) = 2x^3 + px^2 - 4$.

Hence, use remainder theorem to find the remainder when the function $P(x)$ is divided by $(x+1)$.

[4 marks]

**Continued...**

**QUESTION 5 [10 marks]**

a) Find the value of $k$ if the lines $3x+ky+6=0$ and $5x-y-1=0$ are perpendicular.

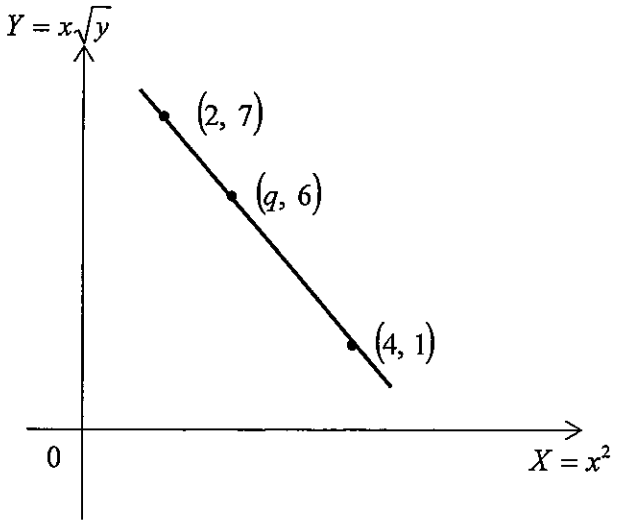
[2 marks]

b) Transform the equation of a circle $x^2-12x+y^2+12y+36=0$ to the form $(x-h)^2+(y-k)^2=r^2$, where $h$, $k$ and $r$ are real numbers.
Hence, find the center and radius of the circle.

[3 marks]

c) Two variables $x$ and $y$ are related by an equation $y=f(x)$.

The figure below shows a straight line graph by plotting $Y=x\sqrt{y}$ against $X=x^2$. Points $(2, 7)$, $(q, 6)$ and $(4, 1)$ lie on the line.




i) Find the slope and $Y$-intercept of the line.

ii) Express $x\sqrt{y}$ in terms of $x^2$.

iii) Find the value of $y$ when $x=2$.

iv) A point $(q, 6)$ lies on the straight line. Find the value of $q$.

[5 marks]

**End of Page.**